

Executive Summary

The maritime mobile frequency band supports maritime communications worldwide. Appendix 18 of the ITU Radio Regulations (RR) defines the channels of the maritime mobile service. These channels support a variety of communication functions including: public correspondence, intership and ship-to-coast, coast-to-ship, port operations, calling and various safety purposes. Safety functions include distress, search and rescue, ship movement, navigation (bridge-to-bridge) communications, and maritime safety information broadcasts.

Mariners in the United States and other countries are experiencing interference on channels allocated to the above functions. The Radio Technical Commission for Maritime Services (RTCM) established Special Committee 117 to investigate the interference and determine if the International Electrotechnical (IEC) standard 1097-7 “*Global Maritime Distress and Safety System (GMDSS)-Part 7: Shipborne VHF Radiotelephone Transmitter and Receiver-Operational and Performance Requirements, Methods of Testing and Required Test Results*” would be sufficient to protect marine VHF radios from interference. In support of this effort, NTIA, in coordination with the Coast Guard and RTCM SC-117, undertook a task to test nine commercial and recreational grade marine VHF radios to the IEC standard and perform radiated test in areas where severe cases of interference are occurring. Laboratory testing of the radios to the IEC standard was performed in Boulder, Colorado. The radiated tests were performed in Savannah, Georgia on the Savannah River and on the Mississippi River in New Orleans, Louisiana. Mariners in both locations have been reporting cases of severe interference in the marine VHF band on the waterways for quite some time now. Some of the channels experiencing the interference are key channels used for safety and bridge-to-bridge communications. The interference is very disruptive to normal operations on the river and is distracting to the radio operators.

The IEC laboratory tests and radiated tests were based on receiver SINAD measurements. In the IEC 1097-7 test procedures, the SINAD of a receiver being tested was set to 20 dB by adjusting the desired signal power and then injecting interference into the circuit to reduce the SINAD to 14 dB. The resulting interference-to-signal ratio (I/S) was then calculated in dB and compared to the minimum IEC requirement. The IEC test procedures were used to measure the receiver sensitivity and to calculate the receiver co-channel rejection ratio, adjacent channel selectivity, blocking (saturation) and intermodulation rejection ratio.

All of the radios easily exceeded the minimum receiver sensitivity requirement. Four radios failed the co-channel rejection ratio test and only two radios passed the adjacent channel selectivity test. In most cases the radios which failed were within 3-5 dB of passing the tests. The most important IEC tests, which are related to the complaints about interference in Savannah and New Orleans, were the intermodulation rejection ratio and blocking tests. Four radios passed the intermodulation test while only one passed the blocking tests. Radio L, operating in local mode passed both tests and was the only radio to operate satisfactorily in New Orleans and Savannah. Radio L had an intermodulation rejection ratio of 81 dB while the IEC standard is 68 dB. Therefore, it can be concluded from the results of the IEC tests and radiated tests that the IEC intermodulation rejection ratio performance requirement is not stringent enough for radios operating in some US ports and waterways.

The results of these tests show that the Coast Guard and RTCM should consider the following items when developing a marine VHF radio receiver standard based on the IEC standard: the IEC 1097-7 test procedures and performance objectives do not adequately take into account the severe intermodulation and blocking interference that is occurring in major US ports and waterways such as Savannah and New Orleans, the receiver standards should be based on the power levels of the unwanted signals that have been measured in Savannah and New Orleans, and the intermodulation rejection ratio test should be referenced from a specific wanted signal power level and a minimum SINAD, rather than a receiver's maximum usable sensitivity for a 20 dB SINAD.